BOOK REVIEWS

Lectures in Statistical Physics

Edited by W. C. Schieve and V. S. Turner published by Springer-Verlag, Berlin, Heidelberg, 1974. pp. 341. Price $ 9.30.

This book originated in lectures presented at the Third Advanced School for Statistical Mechanics and Thermodynamics held in Austin, Texas, U.S.A. in 1972, with Professor I. Prigogene as Director. These lectures cover a wide range of subjects covering the disciplines of Physics, Astrophysics and Biophysics. In all there were seven speakers.

Professor William C. Schieve gives an introduction to the formal theory of quantum non-equilibrium statistical mechanics from the point of view of the von Neumann equation. The concept of sub-dynamics is discussed and it is shown that the general kinetic equation may, in a sense, be viewed as an exact dynamics. The quantum Boltzmann equation is derived and its relationship to scattering theory brought out to enable the calculation of the quantum corrections to the transport coefficients obtained by the method of Chapman and Enskog. Professor Claude George, continuing this formal presentation, gives the general framework of quantum mechanical transformation theory. The *star unitary* transformation appropriate to large dissipative systems is presented and applied to the general kinetic equation to yield a simpler and more detractable form.

Professor Jürgen Ehlers describes the kinetic theory of gases in the framework of general relativity theory, giving justification for such a theory. He derives the hydrodynamic equations and generalizes the transport equations by adapting Chapman—Enskog method. Professor Richard Millar describes computer experiments to simulate n-body gravitating systems. Values of n upto 205 can be taken for this purpose. He discusses computer simulation of the formation and persistence of spiral structure in spiral galaxies. He also discusses the dynamics of a 32-body stellar system and examines the role of pair correlations in stellar systems and comments on some of the difficulties encountered in attempts, to perform. *Thermodynamic experiments* on self-gravitating systems.

Professor Elliot W. Montroll discusses the propagation of waves in harmonic, anharmonic and defect lattices. He gives a detailed analysis of the problem of ergodicity in a linear chain of particles which interact through a non-linear interparticle force. He also discusses the existence of solutions which preserve their character as a function of time, that is solutions, both in the discrete case and the continuous case when the lattice spacing vanishes. These questions are further explored by Professor Joseph Ford in his article on computer solutions of few-particle non-linear oscillator systems. Such simulations illustrate the violation of some known criteria for orbital stability. He shows that for exponentialing trajectories exist for oscillator systems leading to an inversible behaviour.

Dr. Jack S. Turner presents general theoretical foundation for a unified study of dissipative instabilities in non-equilibrium thermodynamics. He gives a few simple examples to indicate the wide variety of ordered behaviour which chemical systems may exhibit beyond instability. By way of illustration he discusses two classes of phenomena in biological context and gives specific mathematical models which exhibit the observed behaviour.

F. C. A.

General theory of relativity

Edited by C. W. Kilmister (Pergamon Press, 1973).

After his earlier book on the special theory of relativity, Prof. Kilmister has written a new book on the general theory of relativity which seems very useful for those who want to know the present position of the general theory of relativity starting from very beginner's level. In this sense, it is an ideal book for non-relativist physicists and mathematicians as well as a good text book for the students.

The author has divided the whole book into two parts. In the first part, we find detailed discussions on the underlying concepts as well as on some important results of Einstein's theory of gravitation, often by analogy with Newton's theory of gravitation and theory of classical electrodynamics. This part also contains a chapter on modern developments where the author has given an outline of some very important aspects of the general theory like gravitational radiation, gravitational collapse and also discussed about the spinor technique in general relativity.

The second part contains all original papers, numbering eleven altogether. This part begins with a famous paper by R. Riemann, on the foundations of differential geometry. The paper here is a translation of the original German paper by a man no less than W. K. Clifford, who is incidentally also the author of the second paper, *On the Space-theory of Matter*, whose abstract is only given here. Then, is followed by three famous early papers of Einstein, including the celebrated work, "The *The Foundations of General Relativity Theory.*

The rest of this part contains two papers on gravitational radiation by F. Pirani and H. Bondi *et al*, the famous work of J. Oppenheimer and H. Snyder on gravitational contraction, the work of R. Penrose on spinor approach, an important analysis of gravitation theory by V. Fock and lastly a paper by R. Pound and G. Rebka, where they proposed an experiment to check the gravitational red-shift on emitting Mossbauer -lines.

These papers help one to understand the position of general relativity upto the end of fifties. Though the book came out only in 1973, very conspicuously it does not contain anything on relativistic astrophysics which has incidentally opened not only a very widerscope of general relativity but where the general theory has found very fruitful practical applications too.

U. K. D.